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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,268	07/26/2006	Hiroaki Takaiwa	128865	8388
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EXAMINER				
LIU, MICHAEL				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/587,268

**Applicant(s)**

TAKAIWA ET AL.

**Examiner**

Michael Liu

**Art Unit**

2851

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 April 2008.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-51 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☒ Claim(s) 36-47, 50 and 51 is/are allowed.  
6) ☒ Claim(s) 1, 2, 4-14, 18, 20-24, 26, 27, 48 and 49 is/are rejected.  
7) ☒ Claim(s) 3, 15-17, 19, 25, 28-33 and 35 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 7/26/06 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-949)  
3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 7/26/06, 2/14/07, 5/17/07.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of Group I, claims 1-41 and 48-50 in the reply filed on 4/7/08 is acknowledged. The traversal is on the ground(s) that "the subject matter of all claims is sufficiently related that a thorough search for the subject matter of any one Group of claims would encompass a search for the subject matter of the remaining claims" [Response, P1L15-17]. This is found persuasive and therefore, the restriction is now withdrawn. Accordingly, all claims will be examined in this Office Action.

### ***Information Disclosure Statement***

2. The information disclosure statements filed 7/26/06 and 2/14/07 fail to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. The list of US patent documents that do comply with all the requirements of 37 CFR 1.97 and 37 CFR 1.98 have been considered. However, all the foreign patent documents have not been considered, because no copy of any foreign reference has been provided to the examiner. A line has been drawn through the citations to show which references have not been considered.

***Specification***

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Immersion exposure apparatus and device manufacturing method with detection apparatus to detect liquid characteristics.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 2, 4-14, 22, 24, 26, 27, 48, and 49 are rejected under 35 U.S.C. 102(e) as being anticipated by Mulken et al (2005/0132914).

**Re claims 1 and 48:** Mulken discloses an exposure apparatus [Fig 1] that exposes a substrate W by emitting exposure light PB onto the substrate through a projection optical system PL and a liquid [see Fig 2], comprising:

a detection apparatus 22 that detects whether the liquid is present on an object WT [Par 0105: "As shown in Fig 4, a detector 22 detects the presence or absence of immersion liquid present on the substrate W."], which is disposed lower than a front end of the projection optical system PL [see Fig 4].

**Re claim 2:** said detection apparatus has an emitting portion 22 that emits detection light [Par 0105: "low intensity electromagnetic waves"] and a light receiving portion 22 disposed at a predetermined position with respect to the detection light.

**Re claim 4:** the detection is performed while relatively moving the detection light of said detection apparatus and said object. [It is inherent that the detection light, which is EM waves, relatively moves with respect to said object WT while the detection is performed by detector 22. The EM waves clearly move relatively to the substrate table WT to strike and reflect off of the table, as seen in Fig 4.]

**Re claim 5:** said object WT is movable [via second positioning device PW (Par 0099)] with respect to said projection optical system PL.

**Re claim 6:** said object includes a substrate stage WT that is movable [via PW] and holds said substrate W [see Fig 2].

**Re claim 7:** a bending portion that bends an optical path of the detection light of said detection apparatus. [The immersion liquid present on the substrate W in Fig 10 inherently bends an optical path of the detection light, since it has a different refractive index.]

**Re claim 8:** the detection light of said detection apparatus 22 is emitted substantially parallel to a surface of said object WT. [The substrate table WT has multiple surfaces, which includes the vertical surface, in the Y direction of Fig 1. This vertical surface of WT is parallel to the detection light.]

**Re claim 9:** whether the liquid is present in an optical path of the detection light is determined based on a light receiving result of said light receiving portion 22. [Par

0105: "In this example, the detector 22 detects the presence of liquid on the substrate W by the reflection of low intensity electromagnetic waves."

**Re claim 10:** the detection light passes through an area away from the surface of said object WT by less than 5.5 mm. [Detection light strikes the surface of the substrate table WT, which means the detection light is less than 5.5 mm from the surface of WT.]

**Re claim 11:** a position of the liquid on said object WT is obtained based on a light receiving result of said light receiving portion 22. [See Fig 10 and Par 0105. When the detector 22 detects the presence of immersion liquid on substrate table WT, the position of the liquid is inherently determined.]

**Re claim 12:** said detection apparatus 22 emits the detection light to an immersion area [see Fig 10] of the liquid formed between said projection optical system PL and said object WT [see Fig 10].

**Re claim 13:** said detection apparatus 22 emits the detection light to a surface of said object WT [see Fig 4 and Par 0105].

**Re claim 14:** said light receiving portion 22 receives light from the surface of said object, and the liquid on the surface of said object is detected based on the light receiving result. [Par 0105: "In this example, the detector 22 detects the presence of liquid on the substrate W by the reflection of low intensity electromagnetic waves."]

**Re claim 22:** an exposure operation is controlled based on a detection result of said detection apparatus. [Par 0105: "Based on the measurement of detector 22, the controller 21 determines which one or more of optical elements 9, 10, 11, 12 is/are

necessary. The controller can determine which one or more of optical elements 9, 10, 11 and 12 can ensure that the projection beam PB is accurately focused on the upper substrate surface.”]

**Re claims 24 and 49:** Mulkens discloses an exposure apparatus [Fig 1] that exposes a substrate W by emitting exposure light PB onto the substrate through a projection optical system PL and a liquid [see Fig 10], comprising:

a detection apparatus 22 having an emitting portion 22 that emits detection light to an immersion area [see Fig 10] formed between the projection optical system and an object WT disposed on an image plane side of the projection optical system, and a light receiving portion 22 that is disposed at a predetermined position with respect to the detection light, wherein the detection apparatus obtains at least one of a size and a shape of the immersion area based on a light receiving result of the light receiving portion. [Par 0105: “Additionally or alternatively, the detector 22 can determine the quantity of immersion liquid present.” The detector 22 additionally can determine the quantity, or the size, of the liquid.]

**Re claim 26:** a detection by said detection apparatus is performed in parallel with the exposure of said substrate. [Fig 4 shows that both occur in parallel in the Y direction of Fig 1.]

**Re claim 27:** the detection light is emitted to the vicinity of an edge portion of said immersion area [see Fig 10].

6. Claims 1, 20-23, and 48 are rejected under 35 U.S.C. 102(b) as being anticipated by Takahashi (5,610,683).

**Re claims 1 and 48:** Takahashi discloses an exposure apparatus [Fig 1] that exposes a substrate 2 by emitting exposure light [from illumination optical system 3] onto the substrate through a projection optical system 4 and a liquid 23, comprising:

a detection apparatus 801 that detects whether the liquid is present on an object 601 [C8L50-52: "In Fig 8, denoted at 801 is a liquid level gauge for measuring the level of liquid 23 in the cassette 9.", which is disposed lower than a front end 7 of the projection optical system [see Fig 8].

**Re claim 20:** a liquid supply mechanism [pipe from filter 21] that supplies the liquid; and

a liquid recovery mechanism [pipe to circulation pump 20] that recovers the liquid;

wherein an operation of at least one of the liquid supply mechanism and the liquid recovery mechanism is controlled based on a detection result of said detection apparatus. [C9L6-8: "When the liquid 23 of a predetermined quantity is fed, this is detected by the liquid level gauge 801 and the pump 20 is stopped."]

**Re claim 21:** the supply of the liquid by said liquid supply mechanism is stopped if it is determined that the detection result of said detection apparatus 801 is abnormal. [C9L6-8 state that the pump 20 is stopped if it is determined that the detection result of the liquid level gauge 801 is at a threshold stage, which is defined as a predetermined quantity of the liquid 23 has already been fed into the cassette. In this case, the detection result being abnormal is defined as the liquid level gauge 801 detecting the liquid reaching the threshold stage.]



**Re claim 22:** an exposure operation is controlled based on a detection result of said detection apparatus 801. [The amount of the liquid 23 used, which is a predetermined quantity as stated in C9L6-8, in the exposure operation is controlled based a detection result of the liquid level gauge 801.]

**Re claim 23:** a warning is issued if it is determined that a detection result of said detection apparatus is abnormal. [C9L6-8 state that the pump 20 is stopped if it is determined that the detection result of the liquid level gauge 801 is at a threshold stage, which is defined as a predetermined quantity of the liquid 23 has already been fed into the cassette. In this case, the detection result being abnormal is defined as the liquid level gauge 801 detecting the liquid reaching the threshold stage. Once the detection result is abnormal, the liquid level gauge clearly sends a warning signal to the pump 20 so stop it from further pumping in more liquid.]

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 18 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mulken.

Mulken discloses all limitations of the claimed invention except for teaching expressly the detection light is infrared light of a predetermined wavelength.

However, Mulkens does teach, in Par 0105, that the detection light is comprised of low intensity electromagnetic waves. Infrared light can be considered low intensity EM waves, since they propagate at a lower intensity than visible light waves.

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to use well-known low intensity EM waves such as infrared light as the detection light of Mulkens, for the purpose of accurately detecting the presence of immersion liquid for quality exposure.

### ***Double Patenting***

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thornton*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Claim 1 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of copending Application No.

11/651,551. Although the conflicting claims are not identical, they are not patentably

distinct from each other because claim 1 of the '551 application completely reads on claim 1 of the instant application. Even though the '551 claim 1 is more detailed than the instant claim 1, it contains every claim limitation within claim 1 of the instant application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

***Allowable Subject Matter***

11. Claims 3, 15-17, 19, 25, 28-33, and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
12. Claims 36-47, 50, and 51 are allowed.
13. The following is a statement of reasons for the indication of allowable subject matter:

**Re claim 3:** There is no prior art that discloses, in combination with all the other claimed limitations, said detection light is emitted from said emitting portion to a plurality of positions.

**Re claim 15 (and dependent claims 16 and 17):** There is no prior art that discloses, in combination with all the other claimed limitations, the surface of said object irradiated by the detection light includes a recessed portion formed on said object.

**Re claim 19:** There is no prior art that discloses, in combination with all the other claimed limitations, the detection light includes a sheet light flux emitted so that an

Art Unit: 2851

area of the liquid which is equal to or greater than a predetermined size is covered with the sheet light flux.

**Re claim 25:** There is no prior art that discloses, in combination with all the other claimed limitations, the light receiving result of the detection light is emitted to a plurality of positions in said immersion area.

**Re claim 28 (29 and 30):** There is no prior art that discloses, in combination with all the other claimed limitations, the detection light is emitted to each of a plurality of positions in the vicinity of an edge portion of said immersion area.

**Re claim 31 (32 and 33):** There is no prior art that discloses, in combination with all the other claimed limitations, wherein an operation of at least one of the liquid supply mechanism and the liquid recovery mechanism is controlled based on a detection result of said detection apparatus.

**Re claim 35:** There is no prior art that discloses, in combination with all the other claimed limitations, the detection light includes a sheet light flux emitted so that an area of the liquid which is equal to or greater than a predetermined size is covered with the sheet light flux.

**Re claim 36 (37-41 and 50):** There is no prior art that discloses, in combination with all the other claimed limitations, a shape detection apparatus that obtains a shape of the liquid on an object.

**Re claim 42 (43-47 and 51):** There is no prior art that discloses, in combination with all the other claimed limitations, a detection apparatus that detects a contact angle of the liquid.

***Conclusion***

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Liu whose telephone number is 571-272-9019. The examiner can normally be reached on Monday through Friday 9 am - 5 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on 571-272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Michael Liu  
Examiner  
Art Unit 2851

ML 6/16/08

/Diane I Lee/  
Supervisory Patent Examiner, Art Unit 2851